Model 1

Group (1): Choose the correct answer from those given:

[1] The domain of the additive inverse of the function n: $n(x) = \frac{x-2}{x-5}$ is …..

(a) $\mathbb{R} - \{2\}$ (b) $\mathbb{R} - \{5\}$

(c) $\mathbb{R} - \{2, 5\}$ (d) $\{2, 5\}$

[2] The simplest form of the function f: $f(x) = \frac{4x^2-2x}{2x}$, where $x \neq 0$ is …….

(a) $4x^2$ (b) $2x - 1$ (c) $2x$ (d) 2

[3] If A and B are two mutually exclusive events, then P(A ∩ B) = …..

(a) ∅ (b) 1 (c) 0.59 (d) 0

[4] The pair of equations whose S.S. in $\mathbb{R} \times \mathbb{R}$ is ∅ from the following is …..

(a) $3x - y = 4$ and $6x - 2y = 6$.

(b) $3x - y = 2$ and $6x - 2y = 4$.

(c) $3x - y = 4$ and $x - 3y = 4$.

(d) $3x - y = 4$ and $3x + y = 4$.

[5] If $2^5 \times 3^5 = 6^m$, then m = ….

(a) 5 (b) 6 (c) 12 (d) 21

[6] $\mathbb{R}_+ \cap \mathbb{R}_-$ = ……

(a) $\mathbb{R}_+ \cup \mathbb{R}_-$ (b) ∅

(c) $\mathbb{R} - \{0\}$ (d) $\mathbb{R}$

[7] If $f(x) = 2x$, then $f(1) - f(-1)$ = …..

(a) –2 (b) 0 (c) 2 (d) 4

[8] The additive inverse of the fraction $\frac{3}{x^2+1}$ is ……..

(a) $\frac{-3}{x^2+1}$ (b) $\frac{x^2+1}{3}$ (c) $\frac{x^2+1}{-3}$ (d) $\frac{3}{x^2-1}$

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[9] If $n(x) = \frac{1}{x} - \frac{3}{x}$, then $n^{-1}(x)$ = ...

(a) $x - \frac{x}{3}$ (b) $\frac{2}{x}$ (c) $\frac{-x}{2}$ (d) $\frac{x}{2}$

Group (2): Answer the following questions:

[10] If $n_1(x) = \frac{1}{x}$ and $n_2(x) = \frac{x^2+4}{x^3+4x}$.
Prove that: $n_1 = n_2$.

[11] Find the solution set of the following two equations in $\mathbb{R} \times \mathbb{R}$:

$$x - y = 4 \text{ and } x + y = 4.$$

[12] If the set of zeroes of the function $f : f(x) = x^2 + bx + c$ is $\{3, 4\}$, then find the value of each b and c.

[13] If A and B are two events in the sample space of a random experiment $P(A) = \frac{1}{2}$, $P(B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{3}$, then find $P(A \cup B)$.

[14] If $n(x) = \frac{x^2+3x}{x^2+x-6}$.
Find $n^{-1}(x)$ and determine its domain.
If $n^{-1}(x) = 2$, find the value of x.

[15] Find $n(x)$ in its simplest form, then find the domain of n where:
$n(x) = \frac{x^2+3x+9}{x^3-27} + \frac{x^2-x-12}{x^2-9}$.

[16] A bag contains 15 identical balls numbered from 1 to 15, one ball is drawn randomly, if the event A is getting an odd number and the event B is getting a prim number. Find: (1) P(A) (2) P(B)

Answers

Group (1):

[1] (b) [2] (b) [3] (d) [4] (d)
[5] (a) [6] (b) [7] (d) [8] (a)
[9] (c)

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Group (2):

[10] $\because n_1(x) = \frac{1}{x}$

$\therefore$ **The domain of** $n_1 = \mathbb{R} - \{0\}$ **(1)**

$\because n_2(x) = \frac{x^2+4}{x(x^2+4)}$

$\therefore$ **The domain of** $n_2 = \mathbb{R} - \{0\}$

$n_2(x) = \frac{1}{x}$ **(2)**

From (1) and (2): $n_1 = n_2$.

[11] $x - y = 4$ **(1)**

$x + y = 4$ **(2)**

By adding (1) and (2):

$\therefore 2x = 8 \qquad \therefore x = 4$

By substituting in (1):

$\therefore y = 0 \qquad \therefore$ **The S.S. =** $\{(4, 0)\}$

[12] $\because f(3) = 0 \qquad \therefore 9 + 3b + c = 0$

$\therefore 3b + c = -9$ **(1)**

$\because f(4) = 0 \qquad \therefore 16 + 4b + c = 0$

$\therefore 4b + c = -16$ **(2)**

By subtracting (1) from (2): $\therefore b = -7$

and from (1): $\therefore c = 12$.

[13] $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{1}{2} + \frac{2}{3} - \frac{1}{3} = \frac{5}{6}$$

[14] $\because n(x) = \frac{x(x+3)}{(x-2)(x+3)}$

$\therefore n^{-1}(x) = \frac{(x-2)(x+3)}{x(x+3)}$

The domain of $n^{-1} = \mathbb{R} - \{0, 2, -3\}$

$n^{-1}(x) = \frac{x-2}{x}$, **when** $n^{-1}(x) = 2$

$\therefore 2 = \frac{x-2}{x} \qquad \therefore 2x = x - 2$

$\therefore 2x - x = -2 \qquad \therefore x = -2$

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[15] $n(x) = \frac{x^2+3x+9}{(x-3)(x^2+3x+9)} + \frac{(x-4)(x+3)}{(x-3)(x+3)}$

$= \frac{1}{x-3} + \frac{x-4}{x-3} = \frac{x-3}{x-3} = 1$

The domain of n is R – { 3 , −3 }

[16] A = {1 , 3 , 5 , 7 , 9 , 11 , 13 , 15}

B = {2 , 3 , 5 , 7 , 11 , 13}

A ∩ B = {3 , 5 , 7 , 11 , 13}

(1) P(A) = $\frac{8}{15}$ (2) P(B) = $\frac{6}{15} = \frac{2}{5}$

Model 2

Group (1): Choose the correct answer from those given:

[1] The domain of the f: $f(x) = \frac{x-3}{5}$ is .....

(a) $\mathbb{R}$ (b) $\mathbb{R} - \{-4\}$

(c) $\mathbb{R} - \{-4 , 3\}$ (d) $\emptyset$

[2] If A ⊂ S of a random experiment and P(A) = P(À), then P(A) = ...

(a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{8}$

[3] The set of zeroes of the function f: $f(x) = -5x$ is .....

(a) {0} (b) {−5} (c) $\mathbb{R} - \{5\}$ (d) {5}

[4] The domain of the multiplicative inverse of the function f: $f(x) = \frac{x+2}{x+5}$ is .....

(a) $\mathbb{R}$ (b) $\mathbb{R} - \{-5\}$

(c) $\mathbb{R} - \{-2\}$ (d) $\mathbb{R} - \{-2 , -5\}$

[5] The simplest form of the function f: $f(x) = \frac{4-x}{x-4}$, where $x \neq 4$ is .....

(a) –1 (b) 0 (c) 1 (d) 3

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[6] The number of solutions of the two equations $x - \frac{1}{2}y = 4$ and $2x - y = 1$ in $\mathbb{R}^2$ is ……

(a) one solution. **(b) two solutions.**

(c) an infinite number. **(d) zero.**

[7] If a + b = 7 and $a^2 - b^2 = 21$, then a – b = ……

(a) –7 **(b) 7** **(c) –3** **(d) 3**

[8] Half of 2^{10} = ……

(a) 2^5 **(b) 2^8** **(c) 2^9** **(d) 2^{20}**

[9] If A ∩ B = ∅, then P(A – B) = …….

(a) P(A) **(b) P(B)**

(c) P(B – A) **(d) 1**

<u>Group (2): Answer the following questions:</u>

[10] If $(x) = \frac{x^3-8}{x^2+x-6} \times \frac{x+3}{x^2+2x+4}$, find $n(x)$ in the simplest form, showing the domain of n.

[11] Find the solution set of the following two equations in $\mathbb{R} \times \mathbb{R}$:

$$2x - y = 3 \text{ and } x + 2y = 4.$$

[12] If $n_1(x) = \frac{x^2+3x+2}{x^2-4}$ and $n_2(x) = \frac{x^2-1}{x^2-3x+2}$, dose $n_1 = n_2$? Why?

[13] Using the general formula, find the S.S of the equation: $2x^2 - 7x + 4 = 0$ (to the nearest hundredth)

[14] A rectangle is with a length more than its width by 4 cm. if the perimeter of the rectangle is 28 cm. Find the area of the rectangle.

[15] If A, B are two mutually exclusive events from the sample space of a random experiment, P(A) = 0.2 and P(B) = 0.5, find:

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(1) P(A ∪ B). (2) P(A − B).

[16] If $f(x) = \frac{x^2+2x}{x^3+8}$, find $f^{-1}(x)$ in its simplest form, showing its domain and if $f^{-1}(x) = 2$, find the value of x.

Answers

Group (1):

[1] (a) [2] (b) [3] (a) [4] (d)

[5] (a) [6] (d) [7] (d) [8] (c)

[9] (a)

Group (2):

[10] $n(x) = \frac{(x-2)(x^2+2x+4)}{(x-2)(x+3)} \times \frac{x+3}{x^2+2x+4} = 1$

∴ The domain of $n = \mathbb{R} - \{-3, 2\}$ and $n(x) = 1$

[11] $2x - y = 3$ (× 2)

∴ $4x - 2y = 6$ (1)

$x + 2y = 4$ (2)

By adding (1) and (2): ∴ $5x = 10$

∴ $x = 2$, By substituting in (1):

∴ $y = 1$ ∴ The S.S. = {(2 , 1)}

[12] ∵ $n_1(x) = \frac{(x+2)(x+1)}{(x+2)(x-2)}$

∴ The domain of $n_1 = \mathbb{R} - \{-2 , 2\}$

$n_1(x) = \frac{x+1}{x-2}$ (1)

∵ $n_2(x) = \frac{(x-1)(x+1)}{(x-1)(x-2)}$

∴ The domain of $n_2 = \mathbb{R} - \{1, 2\}$

$n_2(x) = \frac{x+1}{x-2}$ (2)

From (1) and (2):

∴ $n_1 \neq n_2$ because the domain of $n_1 \neq$ the domain of n_2.

[13] a = 2, b = –7 and c = 4

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$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{7 \pm \sqrt{(-7)^2-4\times2\times4}}{2\times2}$$

$$= \frac{7 \pm \sqrt{17}}{4}$$

$x \simeq 2.78$ or $x \simeq 0.72$

∴ The S.S. = {2.78 , 0.72}

[14] Let the length = x cm and the width = y cm.

∴ $x - y = 4$ (1)

∵ $2(x + y) = 28$

∴ $x + y = 14$ (2)

By adding (1) and (2):

∴ $2x = 18$ ∴ $x = 9$

By substituting in (1): ∴ $y = 5$

∴ The length is 9 cm and the width is 5 cm.

∴ The area of the rectangle = 9×5

$= 45$ cm^2.

[15] ∵ A and B are two mutually exclusive events.

∴ P (A ∩ B) = 0

(1) P(A ∪ B) = P(A) + P(B)

= 0.2 + 0.5 = 0.7

(2) P(A − B) = P(A) = 0.2

[16] ∵ $(x) = \frac{x^2+2x}{x^3+8} = \frac{x(x+2)}{(x+2)(x^2-2x+4)}$

∴ $f^{-1}(x) = \frac{(x+2)(x^2-2x+4)}{x(x+2)}$,

The domain of $f = \mathbb{R} - \{-2 , 0\}$,

$f^{-1}(x) = \frac{x^2-2x+4}{x}$

∵ $f^{-1}(x) = 2$ ∴ $\frac{x^2-2x+4}{x} = 2$

∴ $x^2 - 2x + 4 = 2x$

∴ $x^2 - 2x + 4 - 2x = 0$

∴ $x^2 - 4x + 4 = 0$ ∴ $(x - 2)^2 = 0$

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$\therefore x - 2 = 0$ $\therefore x = 2$

Model 3

Group (1): Choose the correct answer from those given:

[1] If the fraction $\frac{x-a}{x+5}$ is the multiplicative inverse of $\frac{x+5}{x+3}$, then a = …

(a) -5 (b) -3 (c) 3 (d) 5

[2] The common domain of the two algebraic fractions $\frac{3}{x}$ and $\frac{x+7}{x-1}$ is ….

(a) $\mathbb{R} - \{0\}$ (b) $\mathbb{R} - \{0 , -7\}$

(c) $\mathbb{R} - \{1\}$ (d) $\mathbb{R} - \{0 , 1\}$

[3] If A ⊂ B, then P (A ∩ B) = …..

(a) P(A) (b) P(B) (c) P(B`) (d) P(À)

[4] If $x = 3$ belongs to the solution set of the equation $x^2 - ax - 6 = 0$, then a = ….

(a) 3 (b) 2 (c) 1 (d) -1

[5] The set of zeroes of the function f where $f(x) = \frac{x-3}{x+2}$ is ……

(a) {0} (b) {3} (c) {-2} (d) {3, -2}

[6] If $x + y = 0$ and $x^2 = 25$, then y = ……

(a) -5 (b) 5 (c) ±5 (d) 20

[7] If $\frac{1}{x} + \frac{1}{y} + \frac{1}{xy} = \frac{a}{xy}$, then a = …….

(a) 2 (b) 3 (c) $x + y + 1$ (d) $x + y$

[8] If the two straight lines which represent the two equation $x + 3y = 4$ and $x + ay = 7$ are parallel, then a = …..

(a) 3 (b) 4 (c) 7 (d) 10

[9] If a die is tossed once, then the probability of appearance of an odd number = ….

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) 1 (d) 3

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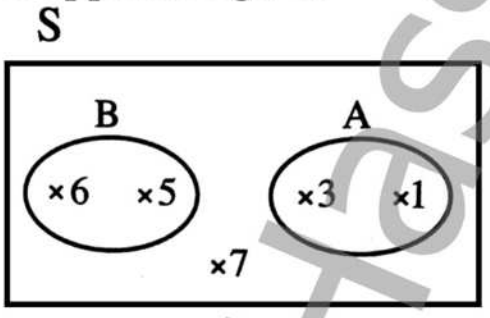
Group (2): Answer the following questions:

[10] Find $n(x)$ in the simplest form showing the domain of n where:

$n(x) = \frac{3}{12x^2-3} - \frac{2x}{4x^2-2x}$, **then find** $n(0)$ **if possible.**

[11] In the opposite figure:



If A and B are two events from the sample space S of a random experiment, then find:

(1) P(A ∩ B). **(2) P(A ∪ B).**

(3) The probability of non-occurrence of the event A.

[12] Find the solution set of the following two equations in $\mathbb{R} \times \mathbb{R}$:

$$y - x = 3 \text{ and } x^2 + xy = 5$$

[13] If the domain of the function n:

$n(x) = \frac{x-5}{2x-b}$ **is** $\mathbb{R} - \{3\}$, **find the value of** b.

[14] If $n_1(x) = \frac{x+5}{x^2-25}$ **and** $n_2(x) = \frac{2}{2x-10}$, **dose** $n_1 = n_2$? **Why?**

[15] Find $n(x)$ in its simplest form showing the domain of the function n, where: $(x) = \frac{x^2+2x}{x^2-9} \div \frac{2x}{x+3}$

[16] Using the general formula, find the S.S of the equation: $x\,(x-1) = 4$ (to the nearest hundredth)

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Answers

Group (1):

[1] (b) **[2] (d)** **[3] (a)** **[4] (c)**

[5] (b) **[6] (c)** **[7] (c)** **[8] (a)**

[9] (b)

Group (2):

[10] $n(x) = \frac{3}{3(2x-1)(2x+1)} - \frac{2x}{2x(2x-1)}$

$\therefore$ **The domain of n** $= \mathbb{R} - \{-\frac{1}{2}, \frac{1}{2}, 0\}$

$$n(x) = \frac{1}{(2x-1)(2x+1)} - \frac{1}{(2x-1)}$$

$$= \frac{1-2x-1}{(2x-1)(2x+1)} = \frac{-2x}{(2x-1)(2x+1)}$$

$n(0)$ **is undefined.**

[11] $\because A \cap B = \emptyset$

(1) $\therefore P(A \cap B) = 0$

(2) $\because P(A) = \frac{2}{5}$ **and** $P(B) = \frac{2}{5}$

$\therefore P(A \cup B) = P(A) + P(B)$

$$= \frac{2}{5} + \frac{2}{5} = \frac{4}{5}$$

(3) $P(\grave{A}) = 1 - P(A) = 1 - \frac{2}{5} = \frac{3}{5}$

[12] From the 1st equation:

$\because y - x = 3 \quad \therefore y = 3 + x \longrightarrow (1)$

Substituting by y in the second equation:

$\therefore x^2 + x(3 + x) = 5$

$\therefore x^2 + 3x + x^2 - 5 = 0$

$\therefore 2x^2 + 3x - 5 = 0$

$\therefore (2x + 5)(x - 1) = 0$

$\therefore$ **Either** $2x + 5 = 0$, **then** $x = -\frac{5}{2}$

Substituting in (1): $\therefore y = \frac{1}{2}$

or $x - 1 = 0$, **then** $x = 1$ **Substituting in (1):** $\therefore y = 4$

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$\therefore$ The S.S = $\{(-\frac{5}{2}, \frac{1}{2}), (1, 4)\}$

[13] $\because$ The domain of n is $\mathbb{R} - \{3\}$

$\therefore 2 \times 3 - b = 0 \quad \therefore 6 - b = 0 \quad \therefore b = 6$

[14] $n_1(x) = \frac{x+5}{(x-5)(x+5)} = \frac{1}{x-5}$, The domain of $n_1 = \mathbb{R} - \{5, -5\}$ (1)

$n_2(x) = \frac{2}{2(x-5)} = \frac{1}{x-5}$, The domain of $n_2 = \mathbb{R} - \{5\}$ (2)

From (1) and (2):

The domain of $n_1 \neq$ the domain of n_2

$\therefore n_1(x) \neq n_2(x)$

[15] $\because n(x) = \frac{x^2+2x}{x^2-9} \div \frac{2x}{x+3}$

$\therefore n(x) = \frac{x(x+2)}{(x-3)(x+3)} \div \frac{2x}{(x+3)}$

The domain of $n = \mathbb{R} - \{3, -3, 0\}$

$\therefore n(x) = \frac{x(x+2)}{(x-3)(x+3)} \times \frac{(x+3)}{2x} = \frac{x+2}{2(x-3)}$

[16] $\because x(x-1) = 4$

$\therefore x^2 - x - 4 = 0$

$\therefore a = 1, b = -1$ and $c = -4$

$\therefore x = \frac{1 \pm \sqrt{1+16}}{2} = = \frac{1 \pm \sqrt{17}}{2}$

$\therefore x \simeq 2.56$ or $x \simeq -1.56$

$\therefore$ The S.S = { 2.56 , – 1.56 }

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موقع الدكتور محمد رزق
Dr.MoRizK